

THE VASCULAR FLORA AND PLANT COMMUNITIES OF CANDY ABSHIER
WILDLIFE MANAGEMENT AREA, CHAMBERS COUNTY, TEXAS, U.S.A.

Jason R. Singhurst

Wildlife Diversity Program
Texas Parks & Wildlife Department
4200 Smith School Road, Austin, Texas 78744 U.S.A.
jason.singhurst@tpwd.state.gov

Amos Cooper

District 7, Wildlife Division
10 Parks & Wildlife Drive
Port Arthur, Texas 77640, U.S.A.

David J. Rosen

Department of Biology
Lee College
Baytown, Texas 77522-0818, U.S.A.

Walter C. Holmes

Department of Biology
Baylor University
Waco, Texas 76798-7388 U.S.A.

ABSTRACT

Field studies at the Candy Abshier Wildlife Management Area, an area of approximately 83 ha (207 acres) of the Gulf Coast Prairies and Marshes vegetation area, have resulted in a description of the vegetation associations and an annotated checklist of the vascular flora. The following four associations occur on the property: (1) the newly described Upper Texas Coast Ingleside Sandy Wet Prairie; (2) Gulf Cordgrass Herbaceous Vegetation; (3) Texas Gulf Coast Live Oak - Sugarberry Forest; and (4) natural depressional ponds. A total of 363 species belonging to 220 genera and 84 families were recorded. A total of 24 exotic plant species were recorded. The families with the largest number of species were Poaceae (63), Cyperaceae (48), Asteraceae (43), Fabaceae (14), and Juncaceae (12). *Rhynchospora chapmanii* and *Euthamia caroliniana* were recorded as new to the Texas flora. Three Texas endemic plants were present: *Thurovia triflora*, *Liatris bracteata*, and *Tradescantia subacaulis*, the former two being tracked as rare plants. Other noteworthy species included *Andropogon capillipes*, *Asclepias longifolia*, *Juncus elliotii*, *Ludwigia hirtella*, *Pinguicula pumila*, *Rhynchospora latifolia*, *Rhynchospora plumosa*, *Sabatia gentianoides*, and *Xyris stricta*.

RESUMEN

Investigaciones de campo en el Área de Manejo de Vida Silvestre, Candy Abshier Wildlife Management Area, con un área de aproximadamente 83 ha, resultaron en una descripción de las asociaciones de vegetación y una lista anotada de la flora vascular. Son cuatro las asociaciones que ocurren en la propiedad: (1) Pradera Mojada Arenosa de la Costa Superior de Texas, Ingleside - nuevamente descrita; (2) Vegetación Herbácea de *Spartina* del Golfo; (3) Bosque de *Quercus-Celtis* del Golfo de Texas; y (4) charcos en depresiones naturales. Se documentaron un total de 363 especies de plantas que pertenecen a 220 géneros y 84 familias. Las familias con las mayores representaciones fueron Poaceae (63), Cyperaceae (48), Asteraceae (43), Fabaceae (14) y Juncaceae (12). *Rhynchospora chapmanii* y *Euthamia caroliniana* fueron registradas por primera vez en Texas. Se encontraron tres especies endémicas: *Thurovia triflora*, *Liatris bracteata* y *Tradescantia subacaulis*, las primeras dos son plantas raras mantenidas en nuestra base de datos. Otras especies de interés son *Andropogon capillipes*, *Asclepias longifolia*, *Juncus elliotii*, *Ludwigia hirtella*, *Pinguicula pumila*, *Rhynchospora latifolia*, *Rhynchospora plumosa*, *Sabatia gentianoides* y *Xyris stricta*.

INTRODUCTION

Currently, only 1.0% (26,304 ha) of the original 2,630,456 ha of coastal prairies still remain in or near its original condition in Texas (Smeins et al. 1991). The coastal prairies, known as the Gulf Coastal Prairie and Marshes vegetational area (Gould 1960), is a region of significant plant endemism. Carr (2009) mentions 104 of the 320 Texas endemic plants as occurring in at least one location in this region. The number of vascular plant species (including introductions) in Texas varies from 4839 (Correll & Johnston 1979) to 5100 (Turner et al. 2003). MacRoberts and MacRoberts (2008) cite the number of species in the Gulf Coastal Prairies and Marshes vegetational area as 2317, showing it to be the richest in species number of any of the vegetation areas of the state. Yet, as of today, there are but few published floristic lists of portions of the area, thus indicating the area has largely been neglected.

Topography of the Gulf Coastal Prairie and Marshes vegetational area is flat to very gently rolling from the Texas-Louisiana border to Harris County (Houston). Included features are barrier islands, beaches, estuarine

lagoons, saline and brackish marshes as well as inland prairies and woodlands of various sorts. This region of the state is considered transitional and largely defined by the absence of pines, clearly distinguishing it from the adjacent Pineywoods vegetational area. Elevations are mostly less than 46 m. Most of the region is underlain by poorly consolidated clays, silts, and sands of Pleistocene or Holocene age. Nearest to the coast lies the Beaumont Formation, which often appears as a featureless plain of black clay. However, sandy materials of point bars, levees, and other depositional environments are also present. While scarcely perceptible topographically, such sands have a major effect on the local diversity of vegetation. Also of note from the city of Beaumont area is a series of former Pleistocene aged barrier islands that now lie on the current shoreline rather than offshore. A strip of the Ingleside barrier island extends through the Candy Abshier Wildlife Management Area (CAWMA) with the sands of this system supporting many species that do not occur on the Beaumont clays to the west. Inland from the Beaumont Formation is the Lissie Formation, which typically has a loamier, sandier surface and a more gently rolling topography. Both the Beaumont and Lissie formations routinely exhibit pimple mounds, several being up to 8 m in diameter and up to 1 m in height. These mounds occur throughout the prairie portion of CAWMA.

STUDY SITE

Candy Abshier was established as a wildlife management area and selected to commemorate Catherine "Candy" Cain Abshier, a former Texas Parks and Wildlife employee who promoted wetland conservation recycling and preservation of historic sites. The site was purchased in 1990. Candy Abshier Wildlife Management Area (CAWMA) is recognized as one of the most popular points on the Great Texas Coastal Birding Trail (TPWD 2012). CAWMA (TPWD 2012) is located on Galveston Bay and Trinity Bay, near Smith Point in Chambers County (Fig. 1). CAWMA ranges from a minimum of sea level to a maximum of 4 m in elevation. Climate of the region is humid subtropical (Bomar 1995) with warm summers while relative humidity is almost always high. Mean annual precipitation averages 140 cm in Chambers County. The average frost free period is 270 days in Chambers County (Natural Fibers Information Center 1987). Hurricanes are relatively rare but over time have exerted a considerable influence on regional vegetation.

The main soil type at CAWMA (Crout 1976) is the Stowell-Clodine association characterized by acid and alkaline, sandy and loamy soils. This association is slightly above sea level and has little natural drainages. The Stowell soils are on sandy ridges from 0.5 to 4 m above sea level. Clodine soils are in depressions 0.25 to 1 m above sea level. Both soils have a surface layer of very dark grey sandy clay loam from 12.7 cm to 38.1 cm in depth. A small portion of CAWMA near the western boundary consists of Veston soils, alkaline and saline soils that support aquatic and salt tolerant grasses and sedges in loamy marine sediments that were deposited by storm tides and wind action. CAWMA consists primarily of coastal prairie habitat with significant important coastal woodlot (oak mottes) and freshwater ponds. Approximately 31 ha of the area are in this oak motte habitat. The remaining area is coastal prairie (50 ha) vegetation and freshwater ponds (2 ha).

MATERIALS AND METHODS

The checklist is based upon specimens that were collected during eleven field trips that were made by two of the authors (Rosen and Singhurst) between 2008 and 2013. Collections are deposited in the Baylor University Herbarium (BAYLU) and University of Texas Herbarium (TEX-LL). The nomenclature follows Plants Database (USDA, NRCS 2014). Plants considered non-native are those that are not part of the native to the flora of Texas and we followed Plants Database (USDA, NRCS 2014).

FLORISTIC RESULTS

Dominant vegetative over story on the CAWMA (Fig. 2) consists of slender bluestem (*Schizachyrium tenerum*), little bluestem (*Schizachyrium scoparium*), brownseed paspalum (*Paspalum plicatulum*), few flowered beaksedge (*Rhynchospora rariflora*), fascicled beaksedge (*Rhynchospora fascicularis*), nutrushes (*Scleria* spp.), gulf cordgrass (*Spartina spartinae*), coastal live oak (*Quercus virginiana*), sugarberry (*Celtis laevigata*), Carolina cherry

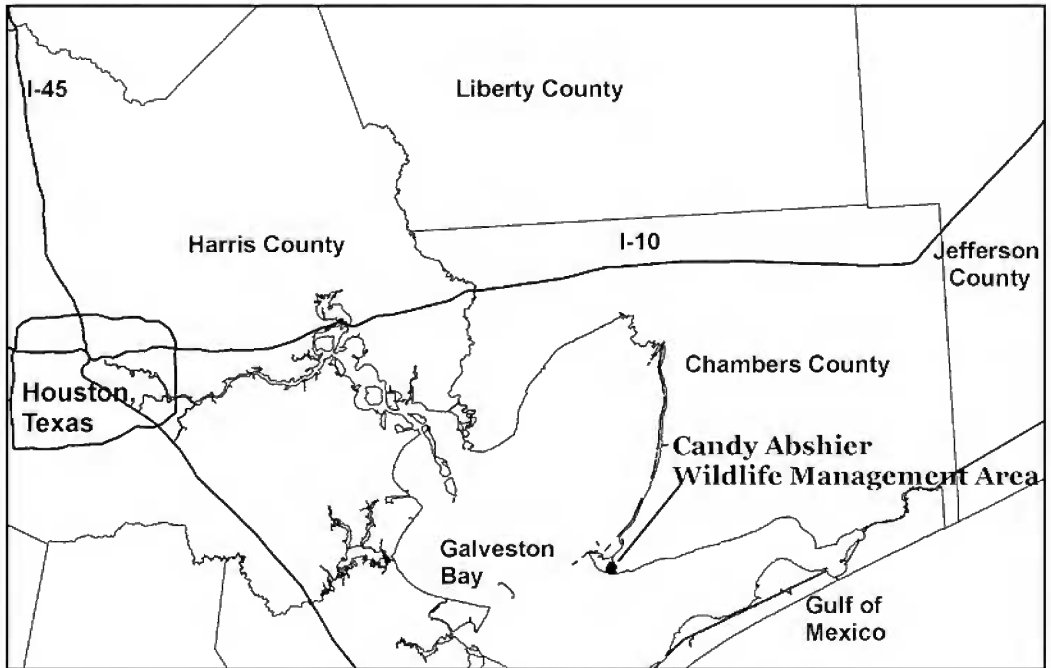


Fig. 1. Candy Abshier Wildlife Management Area, Chambers County, Texas.

laurel (*Prunus caroliniana*), and maidencane (*Panicum hemitomon*). Forbs are mostly annual and perennials with their presence being influenced by rainfall.

A total of 363 species representing 84 families and 220 genera were documented for CAWMA (Appendix 1). Of this total 33 (9.1%) are non-native species. Plant families with the largest number of species were Poaceae with 63 (17.2%), Cyperaceae with 48 (13.1%), and Asteraceae with 43 (11.7%). Several rare and regionally significant plant species were documented. These include threeflower broom-weed (*Thurovia triflora*), bracted blazing-star (*Liatis bracteata*), and stemless spiderwort (*Tradescantia subacaulis*).

The flora of CAWMA was compared with recently published floral checklists of three coastal prairies. These include the flora of Nash Prairie (Rosen 2007) and Mowotony Prairie (Rosen 2010) in Brazoria County, both owned by the Nature Conservancy of Texas and the Warren & Jack Road Prairies (Singhurst et al. 2014) in Harris County, owned by the Katy Prairie Conservancy. The comparisons are presented in Table 1, which shows comparable naturalness represented by a low percentage of non-natives (9% or less) for all four prairie sites. This supports the importance for continued management of all four of these prairie preserves in a landscape that is highly susceptible to much higher percentages of non-native plant invasions. In summary all four of these prairies are extremely important to the conservation of the flora and associated biota of the upper coast of Texas.

PLANT COMMUNITY RESULTS

Based on dominant species, landscape position, and soil water content, four (4) plant community associations were documented at CAWMA. One association is a newly described plant community within Nature Serves classification scheme (NVCS 2014). CAWMA is herbaceous rich with 90% of the species being herbaceous annuals and perennials while only 10% consists of trees, shrubs, and woody vines. For organizational purposes, the plant community association descriptions are discussed by system categories (terrestrial and aquatic veg-



FIG. 2. Candy Abshier Wildlife Management Area Prairie Vegetation.

etation classes). Within each class, one or more associations may be present. The associations generally follow the name, a brief description of each, with emphasis on major characteristic species.

Natural Terrestrial Associations

1. Upper Texas Coast Ingleside Sandy Wet Prairie (*Schizachyrium tenerum* – *Rhynchospora rariflora* – *Rhynchospora plumosa* – *Rhynchospora fascicularis* – *Scleria* spp. Herbaceous Vegetation)

This community, which encompasses about 52 ha, is an upland coastal prairie of the West Gulf Coastal Plain with extremely rich flora diversity. The area is dominated by *Schizachyrium tenerum*, *Rhynchospora rariflora*, *Rhynchospora plumosa*, *Rhynchospora fascicularis*, and *Scleria ciliata*, *S. georgiana*, *S. pauciflora*, and *S. reticularis*. The community is developed on Stowell loamy fine sandy loam that is characterized by an abundance of pimple mounds. Extreme variability in micro-topography is typical, particularly with sandy to sandy loam soils within this prairie type. The most elevated mounds are very sandy and contain xeric sandhill flora found at the summit. The inter-mound swales vary in depth, retaining water from days to weeks after rain events, apparently caused by differential water holding capacity. In a few localized areas sandy ridges, in concert with a series of mounds, act as dry upland features with seasonal seepage migrating from the bases of ridges and mounds to lower areas that are similar to seepage bogs. These areas support such plants as *Lycopodiella alopecuroides* and *Schoenolirion croceum*.

Other characteristic flora included *Andropogon capillipes*, *Anthaenantia rufa*, *Arnoglossum ovatum*, *Dichanthelium acuminatum*, *D. scoparium*, *Drosera brevifolia*, *Eleocharis tuberculosa*, *Eupatorium rotundifolia*, *Gratiola pilosa*, *Helianthus angustifolia*, *Hyptis alata*, *Hypericum crux-andreae*, *Ludwigia hirtella*, *Paspalum floridanum*,

TABLE 1. Floristic comparison of CAWMA flora to three upper coastal prairies in Texas.

Upper Coastal Prairie	County	Hectare	Native (%)	Non-Native (%)	Total
Candy Abshier WMA (TPWD)	Chambers	83 ha	330 (90.9%)	33 (9.1%)	363
Nash Prairie (TNC)	Brazoria	120 ha	289 (89.9%)	22 (7.1%)	311
Mowotony Prairie (TNC)	Brazoria	42 ha	195 (98 %)	4 (2 %)	199
Warren & Jack Road Prairies (KPC)	Harris	321 ha	354 (93.1%)	26 (6.9%)	378

Pinguicula pumila, *Polygala cruciata*, *Rhexia mariana*, *Sabatia gentianoides*, *Viola lanceolata*, *Xyris ambigua*, and *X. stricta*.

2. Gulf Cordgrass Herbaceous Vegetation (*Spartina spartinae* Herbaceous Vegetation)

This community at CAWMA occurs on upland flats just above normal tidal reach and encompasses about 6 ha. *Spartina spartinae* is typically a monodominant, but *Setaria parviflora* is common and *Spartina patens* may be locally codominant. Other characteristic species included *Andropogon glomeratus*, *Cyperus* spp., *Lythrum alatum*, and *Baccharis halimifolia*. Several small patches of saline hardpans (slick spots) are embedded within this plant community. These micro-habitats are sparsely vegetated with hyper-saline flora and included the Texas endemics *Liatis bracteata* and *Thurovia triflora* (Poole et al. 2007). Additional saline flora includes *Borrichia frutescens*, *Limonium carolinianum*, *Lycium carolinianum*, *Monanthochloe littoralis*, *Salicornia depressa*, and *Spergularia marina*.

3. Texas Gulf Coast Live Oak - Sugarberry Forest (*Quercus virginiana* - *Celtis laevigata*/*Prunus caroliniana* Forest)

This association (Diamond 1993) includes woodlands occurring along the upper Gulf Coast of Texas north of Galveston Bay (Brazoria, Chambers, Galveston, and Jefferson counties, TX) on the Ingleside barrier-strand-plain, a Pleistocene barrier ridge. This community at CAWMA encompasses about 24 ha. The canopy is dominated by *Quercus virginiana*. The patchy understory contains *Ilex vomitoria* and *Prunus caroliniana*, which may also reach into the canopy. A few other oak species sporadically occur in this coastal forest and include *Quercus laurifolia*, *Q. nigra*, and *Q. phellos*. Several *Carex* spp. and *Allium canadense* are prominent in the seasonally damp shady understory during the spring and early summer.

Natural Aquatic Associations

Depressional Pond Types.—Pond flora at CAWMA encompasses about 2 ha and is variable due to differences in substrate and water depth. Pond flora is mostly centric with the deeper center of ponds dominated by emergent aquatic plants and then migrating to seasonal flooded outer edges. The deeper portions of the ponds at CAWMA included emergent aquatic flora such as *Nymphaea odorata* and *Utricularia gibba*. With water depth of 15–61 cm (6–24 inches) *Eleocharis quadrangulata*, *Juncus effusus*, *Panicum hemitomon*, *Polygonum hydropiperoides*, *Proserpenica palustris*, *Sacciolepis striata*, and *Schoenoplectus tabernaemontana* are prominent. A water depth of less than 15 cm (6 inches) is dominated by *Hydrolea ovata*, *Juncus repens*, *Juncus roemeriana*, *Ludwigia linearis*, and *Panicum rigidulum*.

DISCUSSION

The overall goal of this research was to document the flora and plant communities of CAWMA. While some data on the flora of upper coastal prairies have been collected on a few prairie sites, there is a great need to study additional prairies. Thus this work will also serve as an invitation to conduct additional studies on the coastal prairies. Southwestern Chambers County contains several small and one large (Middleton Prairie, 324 ha) intact prairies on the Ingleside geologic formation. Preliminary inventory of this prairie (Bridges et al. 2014) has documented the presence of a number of species (~15) that seemingly may be related to tract size and also blurs the distinction between coastal prairie and the adjacent piney woods. Included among these species were indicators of tall grass prairie and seasonal seepage plants more typical of Longleaf Pine Wetland Savannas of

southeast Texas. Included were such species as *Marshallia graminifolia*, *Orbexilum simplex*, *Eriocaulon decangulare*, *Helianthus mollis*, *Asclepias obovata*, and *Rhexia lutea*. This circumstance supports a continued need for additional study of the upper coastal prairies. In conclusion, CAWMA is an extremely important coastal prairie that contains a high diversity of flora, three Texas endemic plants, and a newly described plant community association. We highly encourage further flora inventories of the coastal prairies of Texas.

APPENDIX I. ANNOTATED CHECKLIST OF THE FLORA OF CANDY ABSHIER WILDLIFE MANAGEMENT AREA

The annotated checklist is divided into pteridophytes, gymnosperms, and angiosperms, which subdivided into monocots and dicots. Families, genera, and species are arranged alphabetically beneath each heading. Nomenclature follows USDA, NRCS (2014). Names of collectors are abbreviated as follows: DJR = David Rosen and JRS = Jason Singhurst. An asterisk (*) denotes a non-native species (species not native to Texas). Voucher specimens were verified at and deposited in the Baylor University Herbarium (BAYLU) and University of Texas Herbarium (TEX).

The checklist consists of 84 families, 220 genera, and 363 species. The families with the most species are: Poaceae (63), Asteraceae (43), Cyperaceae (48), Fabaceae (14), and Juncaceae (12).

PTERIDOPHYTES

Azollaceae

Azolla microphylla Kaulf., JRS 20660

Dennstaedtiaceae

Pteridium aquilinum (L.) Kuhn var. *psuedocaudatum*, DJR 4020, JRS 15244

Lycopodiaceae

Lycopodiella alopecuroides (L.) Cranfill, JRS 15214

Polypodiaceae

Pleopeltis polypodioides (L.) Andrews & Windham ssp. *michauxiana* (Weath.) Andrews & Windham, JRS 20663

GYMNOSPERMS

Cupressaceae

Juniperus virginiana L., JRS 16042

Taxodium distichum (L.) Rich., JRS 14931

Pinaceae

Pinus taeda L., JRS 15163

ANGIOSPERMS

MONOCOTYLEDONS

Alismataceae

Sagittaria papillosa Bunch, JRS 14971

Alliaceae

Allium canadense L., DJR 4006 & JRS 20629

Allium drummondii Regel, JRS 16053 & 20628

Nothoscordum bivalve (L.) Britt., JRS 20618

Amoryllidaceae

Cooperia drummondii Herbert, JRS 15260

Hypoxis hirsuta (L.) Coville, DJR 4026

Commelinaceae

Commelina erecta L., DJR 4346, JRS 15265

Tradescantia hirsutiflora Bush, DJR 4028, JRS 14944

Tradescantia subacaulis Bush, DJR 4025, JRS 15243

Cyperaceae

Carex complanata Torr. & Hook., DJR 4103 & 4601

Carex festucacea Schkuhr ex Willd., DJR 4084

Carex longii Mack., DJR 4060

Carex tribuloides Wahlenb., JRS 14981

Cyperus articulatus L., JRS 15231

*Cyperus entrerianus** Boeckl., JRS 14976

Cyperus haspan L., DJR 4085, JRS 15226

Cyperus reflexus Vahl, DJR 4062

Cyperus strigosus L., JRS 15229

Cyperus virens Michx., JRS 14929

Eleocharis flavescens (Pour.) Urb., DJR 4814 & JRS 20601

Eleocharis macrostachya Britton, DJR 4112

Eleocharis montana (Kunth) Roemer. & Schultes, DJR 4063

Eleocharis montevidensis Kunth, DJR 4113 & JRS 20602

Eleocharis palustris (L.) Roem. & Schult., DJR 4112

Eleocharis quadrangulata (Michx.) Roemer & Schultes, JRS 20600

Eleocharis tuberculosa (Michx.) Roemer & Schultes, DJR 4073, 4017, 1019, & 4088

Fimbristylis autumnalis (L.) Roem. & Schult., DJR 4661

Fimbristylis castanea (Michx.) Vahl, JRS 14963

Fimbristylis caroliniana (Lam.) Fernald, DJR 4341

Fuirena breviseta (Coville) Coville, DJR 4304 & 4654, JRS 15213

Fuirena squarrosa Michx., JRS 20603

Isolepis carinata Hook & Arn. ex Torr., JRS 14953

Kyllinga odorata Vahl, DJR 4107, JRS 14954

Rhynchospora chapmannii M.A. Curtis, DJR 4660

Rhynchospora colorata (L.) H. Pfeiffer, JRS 14958

Rhynchospora corniculata (Lam.) A. Gray, JRS 20662

Rhynchospora debilis Gale, DJR 4094, JRS 15205

Rhynchospora divergens Chapm. ex M.A. Curtis, JRS 15205 & 16054

Rhynchospora fascicularis (Michx.) Vahl, DJR 4291 & 4293, JRS 15248

Rhynchospora filifolia A. Gray, DJR 4652

Rhynchospora globularis (Chapm.) Small var. *globularis*, DJR 4051, 4077, & 4083

Rhynchospora glomerata (L.) Vahl, JRS 15186

Rhynchospora gracilentia A. Gray, JRS 15250

Rhynchospora harveyi E. Boot., DJR 4653 & 4657

Rhynchospora inexpansa (Michx.) Vahl, DJR 4294, JRS s.n.

Rhynchospora latifolia (Baldw. ex Ell.) Thomas, JRS 15176

Rhynchospora macrostachya Torr. ex A. Gray, JRS 14972 & 15249

Rhynchospora plumosa Elliott, DJR 4068 & 4087, JRS 14959 & 15161

Rhynchospora rariflora (Michx.) Elliott, DJR 4092 & 4052, JRS 15168

Rhynchospora recognita (Gale) Kral, DJR 4093
Scleria ciliata Michx. var. *glabra* (Chapm.) Fairey, DJR 4110
Scleria georgiana Core, DJR 4057, JRS 15253
Scleria pauciflora Muhl. ex Willd. var. *pauciflora*, DJR 4067, JRS 15204
Scleria reticularis Michx., DJR 4295, 4342, & 4648, JRS 15273
Scleria triglomerata Michx., JRS 15180
Schoenoplectus californicus (C.A. Mey.) Palla, JRS 20659
Schoenoplectus tabernaemontani (K.C. Gmel.) Palla, JRS 20661

Iridaceae

Sisyrinchium atlanticum Bickn., DJR 4009, JRS 14943 & 16055
Sisyrinchium minus Engelm. & A. Gray, DJR 4080, JRS 14942

Juncaceae

Juncus brachycarpus Engelm., DJR 4003 & 4808
Juncus bufonius L., DJR 4676, JRS 16059
Juncus coriaceous Mackenzie, JRS 14980
Juncus dichotomus Elliott, DJR 4075, JRS 14973
Juncus elliotii Chapm., DJR 4082, JRS 14921
Juncus effusus L., DJR 4670
Juncus marginatus Rostk., DJR 4081, JRS 15192 & 15221
Juncus polycephalus Michx., JRS 15190
Juncus repens Michx., DJR 4816
Juncus roemerianus Scheele, DJR 4066
Juncus tenuis Willd., JRS 15202
Juncus validus Coville var. *validus*, DJR 4297, JRS 14967 & 15295

Melanthiaceae

Schoenolirion croceum (Michx.) Wood, JRS 20658

Orchidaceae

Spiranthes cernua (L.) Rich., JRS s.n.
Spiranthes praecox (Walter) S. Watson, DJR 4058, JRS 14979

Poaceae

Agrostis hyemalis (Walter) Britton, Sterns & Poggenb., DJR 4004, JRS 14957
Andropogon capillipes Nash (syn = *Andropogon virginicus* var. *glaucus*), JRS 20567
Andropogon glomeratus (Walter) Britton, Sterns & Poggenb., JRS 20655
Andropogon ternarius DJR 4647 Michx., JRS 20656
Andropogon virginicus L. var. *virginicus*, DJR 4646
Anthaenantia villosa (Michx.) P. Beauv., JRS 20654
Aristida lanosa Muhl. ex Ell., JRS 20653
Aristida longespica Poir., JRS 20652
Aristida purpurascens Poir., DJR 4649
Axonopus fissifolius (Raddi) Kuhlm., DJR 4022, JRS 15219
Axonopus furcatus (Flueggé) Hitchc., DJR 4659
Bothriochloa laguroides (DC.) Herter, JRS 20650
*Briza minor** L., JRS 14937
*Bromus catharticus** Vahl, DJR 4680
Cenchrus spinifex Cav., JRS 15281
*Chloris gayana** Kunth, JRS 14955
*Cynodon dactylon** (L.) Pers., JRS 14946
Dichantherium aciculare (Desv. ex Poir.) Gould & C.A. Clark subsp. *aciculare*, DJR 4050, 4016, 4053, & 4099, JRS 15252
Dichantherium acuminatum (Sw.) Gould & C.A. Clark subsp. *acuminatum*, DJR 4049, 4055, & 4086
Dichantherium acuminatum (Sw.) Gould & C.A. Clark subsp. *lindheimeri* (Nash) Freckmann & Lelong, DJR 4111, JRS 15247
Dichantherium portoricense (Desv. ex Ham.) B.F. Hansen & Wunderlin, DJR 4054
Dichantherium consanguineum (Kunth) Gould & C.A. Clark, DJR 4070
Dichantherium oligoanthes (Schult.) Gould subsp. *scribnerianum* (Nash) Freckmann & Lelong, DJR 4008
Dichantherium scabriusculum (Ell.) Gould & C.A. Clark, JRS 20664

Dichantherium scoparium (Lam.) Gould, DJR 4096, JRS 15175
Dichantherium sphaerocarpon (Elliott) Gould, DJR 4102
Dichantherium tenue (Muhl.) Freckmann & Lelong, DJR 4071
Distichlis spicata (L.) Greene, JRS 20649
Elymus virginicus L., JRS 20651
Eragrostis elliotii S. Watson, DJR 4655
Eragrostis lugens Nees., DJR 4658
Eragrostis refracta (Muhl.) Scribn., DJR 4662
Eragrostis spectabilis (Pursh) Steud., JRS 20648
Eragrostis secundiflora Presl ssp. *oxylepis* (Torr.) S.D. Koch., JRS 15188
Eustachys petraea (Sw.) Desv., DJR 4106
Leersia hexandra Sw., DJR 4072
Monanthochloe littoralis Engelm., JRS 15242
Muhlenbergia capillaris (Lam.) Trin., JRS 20609
Panicum anceps Michx., JRS 15194
*Panicum repens** L., DJR 4064
Panicum rigidulum Nees, JRS 15234
*Paspalum dilatatum** Poir., JRS 15237
Paspalum floridanum Michx., DJR 4340, JRS 15187
Paspalum minus E. Fourn., DJR 4305
Paspalum monostachyum Vasey, DJR 4667 & JRS 20599
Paspalum plicatulum Michx., DJR 4098, JRS 15182
Paspalum setaceum Michx., JRS 4668
*Paspalum urvillei** Steud., JRS 15238
Panicum verrucosum Muhl., DJR 4662
*Poa annua** L., DJR 4677
*Polygomon monspeliensis** (L.) Desf., JRS 16063
Sacciolepis striata (L.) Nash, DJR 4651, JRS 15294
Schizachyrium tenerum Nees, DJR 4296, JRS 15288
Schizachyrium scoparium (Michx.) Nash, DJR 4666
Setaria parviflora (Poir.) Kerguelén, JRS 15236
Sorghastrum nutans (L.) Nash, DJR 4665
Spartina patens (Ait.) Muhl., JRS 15199
Spartina spartinae (Trin.) Merr. ex Hitchc., JRS 15195 & 15169
Sporobolus pyramidatus (Lam.) Hitchc., JRS 20610
Sporobolus virginicus (L.) Kunth, JRS 15224
*Stenotaphrum secundatum** (Walt.) Kuntze, JRS 15191
Tridens strictus (Nutt.) Nash, JRS 20647
Vulpia octoflora (Walter) Rydb. var. *octoflora*, DJR 4076

Smilacaceae

Smilax bona-nox L., JRS 14910 & 15170
Smilax glauca Walt., JRS 15290 & 14922
Smilax smallii Morong, JRS 15255

Typhaceae

Typha domingensis Pers., JRS 15228

Xyridaceae

Xyris ambigua Kunth, JRS 15208
Xyris jupicai Rich., DJR 4306
Xyris stricta Chapm., DJR, 4292, JRS 15203

DICOTYLEDONS

Acanthaceae

Dyschoriste linearis (Torr. & A. Gray) Kuntze, DJR 4747
Ruellia humilis Nutt., JRS 15013 & 15206

Altingiaceae

Liquidambar styraciflua L., JRS 16061

Apiaceae

Ammoselinum butleri (S. Watson) J.M. Coult. & Rose, DJR 4012
Chaerophyllum tainturieri Hook. var. *tainturieri*, DJR 4674
Centella erecta (L.) Fern., JRS 15258 & 14917
Hydrocotyle bonariensis Comm. ex Lam., JRS 15223
Hydrocotyle umbellata L., DJR 4091

Limnoscium pinnatum (Engelm. & A. Gray) Math. & Const., JRS 14960

Trepocarpus aethusae Nutt. ex DC., JRS 14938

Apocynaceae

Asclepias longifolia Michx., DJR 4823, JRS 15293

Asclepias verticillata L., JRS 14918

Cynanchum angustifolium Pers., JRS 15266

Aquifoliaceae

Ilex vomitoria Walt., JRS 14903

Asteraceae

Ambrosia artemisiifolia L., JRS 15230

Aphanostephus skirrhobasis (DC.) Trel., JRS 15285

Arnoglossum ovatum (Walt.) H.E. Robins., JRS 15178

Baccharis halimifolia L., JRS 15198

Bigelovia nuttallii L.C. Anders., JRS 15167

Boltonia diffusa Ell., DJR 4029 & JRS 14915 & 15173

Borrichia frutescens (L.) DC., JRS 15268 & 15012

Cirsium horridulum Michx., JRS 16060

Conoclinium coelestinum (L.) DC., JRS 20646

Coreopsis basalis (A. Dietr.) S.F. Blake, DJR 4105, JRS 14925 & 15261

Coreopsis tinctoria Nutt., JRS 14974 & 5280

Erigeron tenuis Torr. & A. Gray, DJR 4015

Eupatorium compositifolium Walt., JRS 15257

Eupatorium glaucescens Ell., DJR 4299 & JRS 15183

Eupatorium rotundifolium L., DJR 4298 & JRS 15254

Euthamia caroliniana (L.) Greene ex Porter & Britton, JRS 15467

Euthamia leptoccephala (Torr. & A. Gray) Greene ex Porter & Britt., JRS 20646

Eurybia hemispherica (Alexander) Nesom, JRS 20645

*Facelis retusa** (Lam.) Sch. Bip., JRS 20626

Gaillardia pulchella Foug., JRS 15216

Gamochaeta purpurea (L.) Cabrera, DJR 4104

Helianthus angustifolia L., DJR 4343 & JRS 15174

Heterotheca subaxillaris (Lam.) Britt. & Rusby, JRS 15179 & 16056

Iva angustifolia Nutt. ex DC., JRS 20644

Iva annua L., JRS 20643

Krigia dandelion (L.) Nutt., JRS 14948

Liatris acidota Engelm. & A. Gray, DJR 4349 & JRS 15184

Liatris bracteata Gaiser, JRS 15172

Palafoxia hookeriana Torr. & A. Gray, JRS 20667

Pityopsis graminifolia (Michx.) Nutt., JRS 20666

Pluchea rosea Godfrey, DJR 4300

Pluchea foetida (L.) DC., JRS 15165

Pyrrhopappus carolinianus (Walter) DC., JRS 16041

Rudbeckia hirta L., JRS 15165

Solidago sempervirens L., JRS 20604

Solidago odora Ait., JRS 20642

Solidago rugosa Mill., JRS 20641

Solidago tortifolia Ell., DJR 4023 & JRS 14965

*Soliva sessilis** Ruiz & Pav., JRS 20627

*Sonchus asper** (L.) Hill, JRS 14935

Symphytotrichum dumosum (L.) Nesom var. *dumosum*, JRS 20671

Verbesina virginica L., JRS 20614

Brassicaceae

Cardamine pennsylvanica Muhl. Ex. Willd., JRS 20607

Lepidium densiflorum Schrad., JRS 16046

Lepidium virginicum L., JRS 14952 & 16042

Cabombaceae

Cabomba caroliniana A. Gray, JRS 20597

Campanulaceae

Lobelia appendiculata A. DC., JRS 20592

Lobelia puberula Michx., DJR 4663, JRS 20633

Triodanis perfoliata (L.) Nieuw., JRS 14936

Cannabaceae

Celtis laevigata Willd., JRS 2063

Caprifoliaceae

*Lonicera japonica** Thunb., JRS 14901

Sambucus nigra L., JRS 20617

Caryophyllaceae

*Arenaria serpyllifolia** L., JRS 20620

*Cerastium glomeratum** Thuill., DJR 4673 & JRS 20605

Silene antirrhina L., JRS 14907 & 16051

Spergularia salina J. Presl & C. Presl., DJR 4013

*Stellaria media** (L.) Vill., DJR 4678

Chenopodiaceae

Salicornia depressa Standl., JRS 14977

Clusiaceae

Hypericum drummondii (Grev. & Hook.) Torr. & A. Gray, JRS 20640

Hypericum crux-andreae (L.) Crantz, DJR 4350, JRS 14902

Hypericum galioides Lam., DJR 4807

Hypericum gymnanthum Engelm. & A. Gray, DJR 4095

Hypericum hypericoides (L.) Crantz, DJR 4348, JRS 14919 & 15251

Hypericum mutilum L., JRS 20639

Hypericum punctatum Lam., DJR 4824

Convolvulaceae

Evolvulus sericeus Sw., DJR 4014

Ipomoea sagittata Poir., JRS 15189

Cuscutaceae

Cuscuta cuspidata Engelm., JRS 15262

Droseraceae

Drosera brevifolia Pursh, DJR 4032

Ebenaceae

Diospyros virginiana L., JRS 14909

Euphorbiaceae

Chamaesyce maculata (L.) Small, JRS 15232

Croton glandulosa L., JRS 15185

*Triadica sebifera** (L.) Small, JRS 14905 & 15220

Fabaceae

Baptisia bracteata Muhl. ex Elliott var. *leucophaea* (Nutt.) Kartesz & Gandhi, DJR 4021, JRS 15200

Centrosema virginianum (L.) Benth., DJR 4347, JRS 15217

Chamaecrista fasciculata (Michx.) Greene, DJR 4344, JRS 15210

Crotalaria sagittalis L., DJR 4109

Desmanthus illinoensis (Michx.) McM. ex B.L. Rob. & Fern., JRS 15235

*Medicago lupulina** L., DJR 4675

*Medicago polymorpha** L., JRS 16050

*Melilotus officinalis** (L.) Lam, JRS 14961

Mimosa hystrix (Small ex Britt. & Rose) B.L. Turner, DJR 4822, JRS 15177

Neptunia pubescens Benth., JRS 15287

*Sesbania punicea** (Cav.) Benth., DJR 4351

Tephrosia onobrychoides Nutt., JRS 20638

Vicia ludoviciana Nutt., JRS 14939

Vicia minutiflora Dietr., JRS 14949

Fumariaceae

Corydalis micrantha (Engelm. ex A. Gray) A. Gray, JRS 20606

Fagaceae

Quercus laurifolia Michx., JRS 14913

Quercus nigra L., JRS 14911

Quercus nuttallii Palmer, JRS 14930

Quercus phellos L., JRS 14927

Quercus virginiana P. Mill., JRS 14912

Gentianaceae

*Centaurium pulchellum** (Sw.) Druce, DJR 4010, JRS 14962

Eustoma exaltatum (L.) Salisb. ex G. Don ssp. *exaltatum*, JRS 15241

Sabatia campestris Nutt., JRS 14966

Sabatia gentionoides Ell., JRS 15211 & DJR 4813

Geraniaceae

Geranium carolinianum L., JRS 14945 & 16049

Haloragaceae

Proserpinaca palustris L., DJR 4815 & 4811, JRS 20668

Hydrophyllaceae

Hydrolea ovata Choisy., JRS 15222

Juglandaceae

Carya aquatica (Michx. f.) Nutt., JRS 15245

Lamiaceae

Hyptis alata (Raf.) Shinnars, JRS 15279

Hedeoma hispida Pursh, JRS 20619

Monarda punctata L., JRS 15181

Physostegia intermedia (Nutt.) Engelm. & A. Gray, DJR 4089

Physostegia pulchella C. L. Lundell, JRS 14978

Salvia lyrata L., JRS 16064

Scutellaria integrifolia L., JRS 20611

Lauraceae

*Cinnamomum camphora** (L.) J. Presl, JRS 14926

Persea borbonia (L.) Spreng., JRS 20608

Sassafras albidum (Nutt.) Nees, JRS 20634

Lentibulariaceae

Pinguicula pumila Michx., DJR 4027

Utricularia gibba L., DJR 4817, JRS 20637

Utricularia subulata L., DJR 4031, JRS 14934

Linaceae

Linum medium (Planch.) Britton var. *texanum* (Planch.) Fernald, DJR 4302, 4078, JRS 15177 & 15263

Linum striatum Walt., JRS 15196

Linum sulcatum Riddell, JRS 16040

Loganiaceae

Gelsemium sempervirens (L.) J. St.-Hil., DJR 4672

Mitrella sessilifolia (J.F.Gmel) G. Don, JRS 15209

Lythraceae

Lythrum alatum Pursh, JRS 14975 & 15239

Lythrum lineare L., JRS 15272

Malvaceae

Hibiscus lasiocarpus Cav., JRS 1520

Malvastrum arboreum Dill. ex Cav., JRS 20621

Sida rhombifolia L., JRS 14947 & 15215

Melostomataceae

Rhexia mariana L., JRS 15207

Myricaceae

Morella caroliniensis (P. Mill.) Small, JRS 15246

Morella cerifera (L.) Small, DJR 4018, JRS 14904

Nymphaeaceae

Nymphaea odorata Aiton, DJR 4818, JRS 20598

Nyssaceae

Nyssa sylvatica Marsh., JRS 15193

Onagraceae

Gaura lindheimeri Engelm. & A. Gray, JRS 15162

Ludwigia glandulosa Walter, JRS 4812

*Ludwigia grandiflora** (M. Micheli) Greuter & Burdet ssp. *grandiflora*, JRS 15227

Ludwigia hirtella Raf., JRS 15256

Ludwigia linearis Walter, DJR 4352

Oenothera heterophylla Spach, JRS 15225

Oenothera laciniata Hill, DJR 4679

Oenothera linifolia Nutt., DJR 4005

Oenothera speciosa Nutt., JRS 14956, 20613

Orobanchaceae

Agalinis fasciculata (Ell.) Raf., DJR 4097, JRS 15164 & 15283

Agalinis martitima (Raf.) Raf., JRS 20612

Agalinis purpurea (L.) Pennell, JRS 20669

Buchnera americana L., DJR 4079, JRS 14924 & 15286

Castilleja indivisa Engelm., JRS 20622

Oxalidaceae

Oxalis dillenii Jacq., JRS 16044

Oxalis violacea L., JRS 20670

Phytolaccaceae

Phytolacca americana L., JRS 15282

Plantaginaceae

Mecardonia acuminata (Walt.) Small, JRS 20636

Nuttallanthus canadensis (L.) Sutton, JRS 14940 & 20631

Plantago pusilla Nutt., JRS 16045

*Plantago lanceolata** L., JRS 14950

Plantago virginica L., DJR 4011

Veronica peregrina L., JRS 20623

Plumbaginaceae

Limonium carolinianum (Walt.) Britt., JRS 15267

Polygalaceae

Polygala cruciata L., DJR 4345, JRS 15292

Polygala leptocaulis Torr. & A. Gray, JRS 15259

Polygala mariana Mill., DJR 4108

Polygonaceae

Polygonum hydropiperoides Michx., JRS 14906

*Rumex crispus** L., JRS 16052

Rumex hastatulus Baldw., JRS 14941

Portulacaceae

Claytonia virginica L., JRS 20630

Phemeranthus parviflorus (Nutt.) Kiger, JRS 15269 & 14968

Primulaceae

*Anagallis arvensis** L., JRS 15278

Anagallis minima (L.) Krause, R 4024, JRS 14982

Ranunculaceae

Anemone berlandieri Pritz., JRS 20625

Ranunculus hispidus Michx., JRS 20624

Rosaceae

Prunus caroliniana (Mill.) Ait., JRS 14933

*Rosa bracteata** J.C. Wendl., JRS 14923

*Rosa laevigata** Michx., DJR 4669

Rubus arguta Link, JRS 15166

Rubus riograndis Bailey, JRS 14916

Rubiaceae

Diodia teres Walt., JRS s.n.

Diodia virginiana L., JRS 15264

Galium aparine L., JRS 16048

Galium tinctorium L., JRS 14900

Houstonia pusilla Schoepf, JRS 20595

Houstonia micrantha (Shinnars) Terrell, JRS 20593

Houstonia rosea (Raf.) Terrell, JRS 20594
Oldenlandia uniflora L., DJR 4100 & JRS 15284
*Sherardia arvensis** L., DJR 4681

Rutaceae

Zanthoxylum clava-herculis L., DJR 4819

Salicaceae

Salix nigra Marshall, DJR 4806

Sapotaceae

Sideroxylon lanuginosum Michx. JRS 20591

Saxifragaceae

Lepuropetalon spatulatum Elliott, JRS 20596

Scrophulariaceae

Gratiola brevifolia Raf., JRS 14920 & 15291
Gratiola pilosa Michx., DJR 4303, JRS 14914 & JRS 15212

Solanaceae

Lycium carolinianum Walt., JRS 14969 & 15271
Physalis angulata L., JRS 15276
Solanum ptycanthum Dunal, JRS 16057

Tetrachondraceae

Polypremum procumbens L., DJR 4301, JRS 15275

Ulmaceae

Ulmus crassifolia Nutt., JRS 20616

Valerianaceae

Valerianella radiata (L.) Dufur, JRS 16047

Verbenaceae

*Lantana camara** L., JRS 14900
Phyla lanceolata (Michx.) Greene, JRS 14964 & 15240
*Verbena brasiliensis** Vell., JRS 14951
Verbena halei Small, JRS 14928

Violaceae

Viola lanceolata L., DJR 4030, JRS 15289
Viola sororia Willd., JRS 20632

Vitaceae

Ampelopsis arborea (L.) Koehne, JRS 15277 & 14932
Vitis rotundifolia Michx., DJR 4820
Vitis mustangensis Buckl., JRS 15233

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